

Claims:

1. A method of providing communication support for collaborative applications comprising abstracting a network and application server resources at a middleware level; and supporting the middleware level by indexing resources in a network aware and application aware manner.
2. The method of claim 1, further including the step of indexing a plurality of users and their communication interests in an application space.
3. The method of claim 2, further including the step of forming a communication overlay tree that provides communication links to application servers and to said plurality of users.
4. A communication network, comprising:
 - a plurality of network resources having network constraints, the network resources including application servers controlled by an application having an application space; and
 - a middleware server connected to said plurality of network resources, including the plurality of application servers, said middleware server for establishing an attribute space based on attribute information that includes said network constraints and on said application servers, the middleware server for indexing the plurality of application servers to reflect their positions in said attribute space, the middleware server further for implementing a communication overlay tree between the plurality of application servers and the middleware server based on network constraints and on the application space.
5. The communication network of claim 4, further including a plurality of users, each having a communication interest in said application space, and where the middleware server indexes the plurality of users according to communication interest to form user index identifiers; and where the communication overlay tree is implemented based on the plurality of users and on their communication interests.

6. The network of claim 4 where the middleware server indexes network addresses of said plurality of users.
7. The network of claim 5 where the middleware server provides said application with user index identifiers via an application server.
8. The network of claim 7 where the application server sends said middleware server a list of users and data that is to be distributed to users on said list of users, such that said middleware server identifies network locations of said users on said list of uses, and such that said middleware server sends data that is to be distributed to the network addresses of users on said list of users.
9. The network of claim 8 wherein said application uses said user index identifiers to produce lists of users to be notified upon an occurrence of a notification event in said application space, and such that said list of users is sent upon an occurrence of a notification event.
10. The network of claim 7 wherein said application server sends said list of users and said data using application program interfaces.
11. The network of claim 4 wherein a change in a network constraint induces said middleware server to implement a new communication overlay tree.
12. A method of virtualizing network resources to support collaborative communications in a network having application servers and users that have communication interests, the method comprising the steps of:
 - constructing a scalable network map;
 - indexing application servers according to their position in the network;
 - indexing users according to their communication interest;
 - generating a communication overlay tree based on the indexing of the applications, on the indexing of the users, and on the network map; and

supporting communications between application servers and users over the communication overlay tree.

13. The method of claim 12 wherein the network map is further based on supporting service level agreements.

14. The method of claim 12 wherein supporting communications includes operating according to middleware software.

15. The method of claim 12 wherein generating a communication overlay tree is repeated upon changes to the network.

16. The method of claim 12 wherein indexing users includes indexing a new user to the network.

17. The method of claim 12 wherein an application server is indexed if it enters the network.

18. A method of operating a communication network, comprising the steps of:

identifying a plurality of network resources and their network constraints;

identifying a plurality of application servers that are controlled by an application having an application space;

identifying a plurality of users and a communication interest in the application space of each user; and

indexing the application servers to reflect their position in an attribute space;

indexing said plurality of users according to communication interests;

forming a user index identifier for each user of said plurality of users; and

establishing a communication overlay tree between the application servers and the users based on the identified network constraints and on the indexed plurality of users.

19. The method of claim 18, further including indexing network locations of each user of said plurality of users.

20. The method of claim 19, further including providing the application with the user index identifier for each user via an application server.

21. The method of claim 20, further including sending data from an application server to at least one user of said plurality of users based on the communication interest of the at least one user and on the user index identifier of the at least one user.

22. The method of claim 18 wherein indexing of the plurality of users includes indexing new users to the network.

23. The method of claim 18 wherein establishing the communication overlay tree is at least partially based on round trip travel times.